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NEOTECTONIC AND PALEOSEISMIC STUDY OF THE PYRAMID LAKE FAULT ZONE NEAR RENO, NEVADA

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Technical abstract

The Pyramid Lake fault zone is a northwest trending, right-lateral fault located at the transition between the Basin and Range and Sierra Nevada in the northern Walker Lane, Nevada. A minimum latest Pleistocene and Holocene slip rate of 2.6 ± 0.3 mm/year is estimated from right-laterally offset geomorphic features formed in post-Lake Lahontan (approx. 15,500 ybp) surfaces. Trench exposures and geomorphic relations indicate that the most recent earthquake on the fault occurred after 1710 ± 175 cal. ybp and probably before 820 ± 95 cal. ybp. A minimum of two earthquakes have occurred since deposition of the Mazama tephra (approx. 7,630 ybp) and at least four earthquakes have occurred on the fault after dessication of Lake Lahontan (approx. 15,500 ybp). These observations suggest that the Pyramid Lake fault zone accommodates a significant portion of geodetically measured strain at 39-40° degrees north latitude at the Basin and Range-Sierra Nevada transition.

Non-technical abstract

The Pyramid Lake fault zone is a northwest trending, right-lateral fault located between Pyramid Lake and Fernley, Nevada. We studied the history of large, ground-rupturing earthquakes on the Pyramid Lake fault by mapping fault-related features and digging trenches across the fault. We find evidence that the average slip rate of the fault is 2.6 ± 0.3 millimeters per year. The most recent earthquake on the fault occurred after 1710 ± 175 years ago and probably before 820 ± 95 years ago. At least four earthquakes have occurred on the fault in the past 15,500 years. Taken together, these observations suggest that (1) the Pyramid Lake fault zone accommodates a significant amount of crustal strain accumulating at the boundary between the Basin and Range and the Sierra Nevada; and (2) every few thousand years the Pyramid Lake fault experiences large earthquakes, and poses a significant potential seismic hazard to the Reno, Nevada urban area.